8

Training and Pruning

FRANK T. YOSHIKAWA AND JAMES H. LARUE

Annual pruning is crucial to the development of peach, plum, and nectarine orchards. During the first years, pruning shapes trees for structural strength, optimum fruit production, and ease of cultivation and harvesting. Proper pruning maintains the strength and fruit-bearing surface of mature orchard trees and helps renew and adjust the amount of fruitwood to obtain high quality fruit production and to reduce fruit thinning costs. Pruning also serves to maintain tree health by removing dead, diseased, or injured wood.

Most peach and nectarine trees grow vigorously. Each spring and summer they produce a large volume of new growth: long, vigorous shoots in the top of the tree and shorter growth below for fruit bearing the following season (fig. 8.1). This new growth bears fruit only once; thus, pruning is required to stimulate new growth. Otherwise, fruit will be produced farther and farther out on lengthening branches each succeeding year. Pruning also helps to thin the succeeding year's crop by removing part of the fruit-bearing shoots and flower buds.

Plum trees vary greatly in vigor, depending upon variety; thus, the type of pruning depends upon the variety and the nature of the fruitwood. Most plum trees grow almost as much as peach and nectarine trees each season. Some plum varieties bear fruit on the previous season's growth and spurs; but, most varieties produce the greatest part of their crop on young vigorous spurs (fig. 8.2). Plum tree shoots

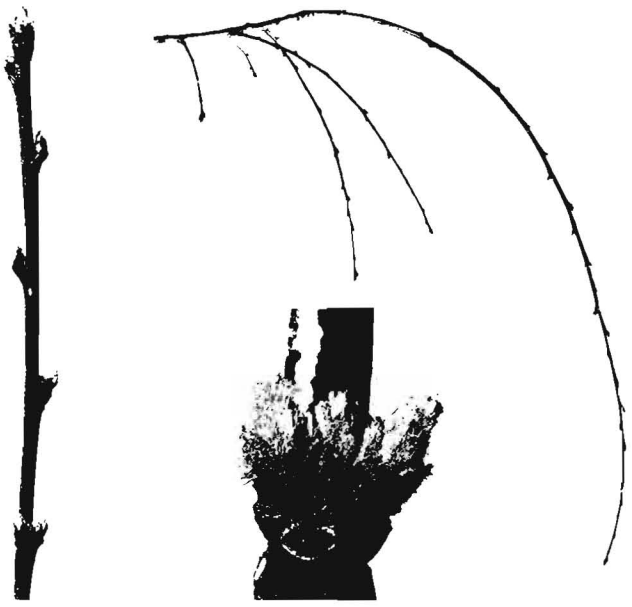

Fig. 8.1. One-year-old shoots of peach showing laterally bearing fruitwood.

Fig. 8.2. Fruiting spurs produce the greatest part of the crop on most plum varieties.

form lateral fruit spurs, stubby fruit-bearing twigs up to about 4 inches long. These spurs grow slightly each year and are usually productive for only a few years. Spur-bearing branches should be replaced after 3 to 5 years to renew spurs for production of more, larger, and better quality fruit.

Pruning can also be used to adjust crop size. Early maturing varieties mature and are ready for harvest 2 to 3 months after bloom. These varieties can produce only a limited number of fruits of marketable size; thus, much fruit must be hand thinned from the tree. Pruning excess fruiting wood from the tree during the previous dormant season will reduce the amount of hand thinning necessary the following spring. Later maturing varieties can produce many more fruits of marketable size: thus, more fruitwood can be left on the tree at pruning time.

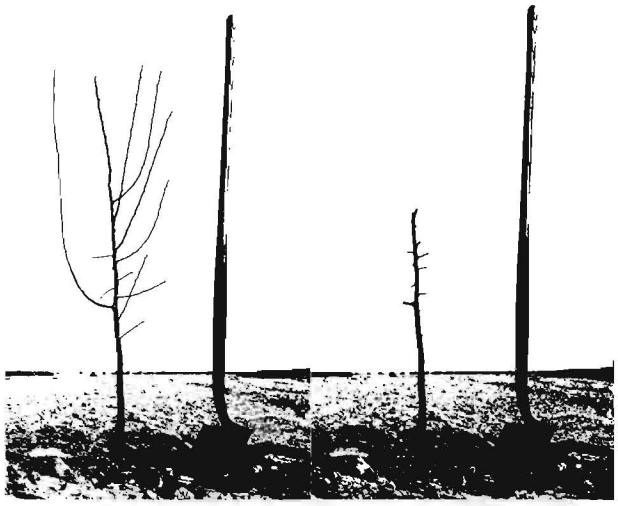

Fig. 8.3. Newly planted trees must be headed to a proper height to promote well positioned shoot growth.

Training Young Trees

Tree training is accomplished during the orchard's first 3 to 4 years to give the tree structural strength to support a maximum, well-distributed crop with sunlight exposure and easy accessibility for cultural and harvesting operations. The open-center or vase-shaped system is most commonly used to train peach, plum, and nectarine trees.

Planting time

Heading an orchard tree (cutting off part of a small tree or branch) at the time of planting determines the height of its crotch – the point at which its primary scaffold branches begin. Until recently (1970s), common commercial practice was to head trees 22 to 24 inches above ground level (fig. 8.3). Today, many growers head their plantings 18 to 20 inches to obtain lower profile trees that will require less ladder work for pruning, thinning, and harvesting.

Nursery trees with small trunks (3/16 to 3/8-inch diameters) usually have no lateral branches. Properly pruned, their trunks should be headed with one cut to the desired height. The primary scaffold limbs that develop within 6 to 10 inches of this cut form the tree's head or crotch. Nursery trees with larger trunks (½-inch diameter and larger) usually have lateral branches. Some of these branches can be removed entirely; others, in desirable locations for primary scaffold limbs, should be headed back to 2- to 4-inch stubs with one or two lateral buds. Their trunks should be headed to the same height as smaller trees. Some larger trees, particularly yearlings, have potential scaffold limbs that can be headed to a length of 6 to 8 inches from their trunks.

Summer training

Many growers prune their trees during the summer of the first growing season. Although young trees cannot be exactly trained during the growing season, their growth can be partially directed by pruning undesirable branches (those not wanted as permanent limbs), pinching back less desirable branches, and removing suckers to enhance growth on branches favorably located for permanent scaffolds. Summer pruning also can help spread the growth of some plum varieties that tend to grow upright rather than outward. New orchards are often lightly pruned once or twice during the growing season. Only experienced personnel should do summer pruning, because it can be especially devitalizing and growth reducing if too much leaf surface is removed.

The same pruning procedure is sometimes followed the second and third summers in some varieties to promote growth in desired branches. Unwanted shoots are pinched back to suppress growth or are pruned off. Not all undesirable branches are completely removed or too much leaf surface is lost, reducing total tree growth. Topping young upright-growing plum trees during May or early June helps restructure their growth pattern, by increasing the number of growing shoots, some of which are on the outside of the tree. A continued growth upward and outward, away from the more compact tree center, insures a more spreading shape to the tree.

Some upright growing plum trees can be shaped to a spreading position by forcibly bending shoots to the outside in mid- to late August of the first and second growing seasons. Careful bending, almost to the point of breaking the shoot, will cause it to remain in a spread position.

Fig. 8.4. Selection of primary scaffold branches is important when pruning 1-year-old peach and nectarine trees.

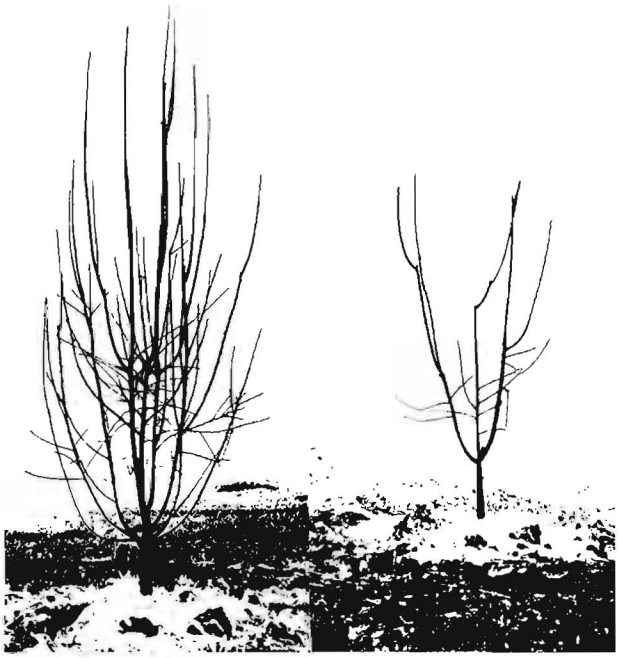

Fig. 8.5. Primary scaffold limb selection for 1-year-old plum trees is important for both upright and spreading varieties.

First-year dormant pruning

The primary scaffold branches selected at the end of the first year's growth (fig. 8.4) develop into the tree's main structural limbs, supporting top growth and crop load in later years. Most potential scaffold limbs grow just below the point on the trunk where it was headed when planted. Three or four limbs are selected as primary branches evenly distributed around the trunk and spaced about 6 inches apart vertically on the trunk where possible. Small lateral shoots along these branches are left for early fruiting, tree growth, and sunburn protection. Water sprouts, as well as branches that might interfere with growth of the primary scaffolds, are removed.

Branches positioned directly above one another make poor future scaffold limbs. Select branches that attach to the tree trunk at a 45-degree angle, avoiding upright limbs with narrow, acute angles because they will be structurally weak in later years. Flat-angled (horizontal) limbs are undesirable for scaffolds because they will not develop structural strength necessary for heavy cropping.

Primary scaffold branches of peach and nectarine trees are headed back to insure secondary branching at the desired height. These scaffolds are headed at 20 to 36 inches above the crotch.

Because many plum varieties grow upright, remove inside branches and select as primary scaffolds those limbs with greater spread (fig. 8.5). Some plum varieties require additional help to spread their young scaffolds, such as sticks (spreaders) that force limbs to the outside. Another way to induce spreading in extremely upright varieties is to cut back branches to 12 inches or less. The resulting vigorous dense growth directs outside branches into a wide-angle growth pattern. The following year, the dense interior shoots are removed. Whatever the method used, the goal is to open the center of the trees so that sunlight can infiltrate. A few naturally spreading varieties must be headed to promote secondary branching at desired points. European plums also must be headed during the first dormant pruning to promote secondary branching.

Subsequent dormant pruning

Secondary scaffold branches are selected during the second dormant season. Two vigorous lateral branches arising 24 to 36 inches above the crotch on each primary scaffold are positioned on the tree to fill its eventual circumference (figs. 8.6 and 8.7). Avoid selecting secondary scaffolds that are positioned directly over one another. Secondary branches are headed, as were the primary scaffolds the previous dormant season, 20 to 36 inches above the junction with the primary scaffolds.

Although two secondaries are usually selected, some primary scaffolds, especially weaker ones, may be left with only one secondary and, in a few cases,

Fig. 8.6. Secondary scaffold branches are selected on peaches and nectarines the second dormant season.

three may be warranted because of vigor and placement. If more than two secondary scaffolds are left per primary scaffold, some resulting limbs may become weak, develop less fruitwood, and be prone to break with heavy crops.

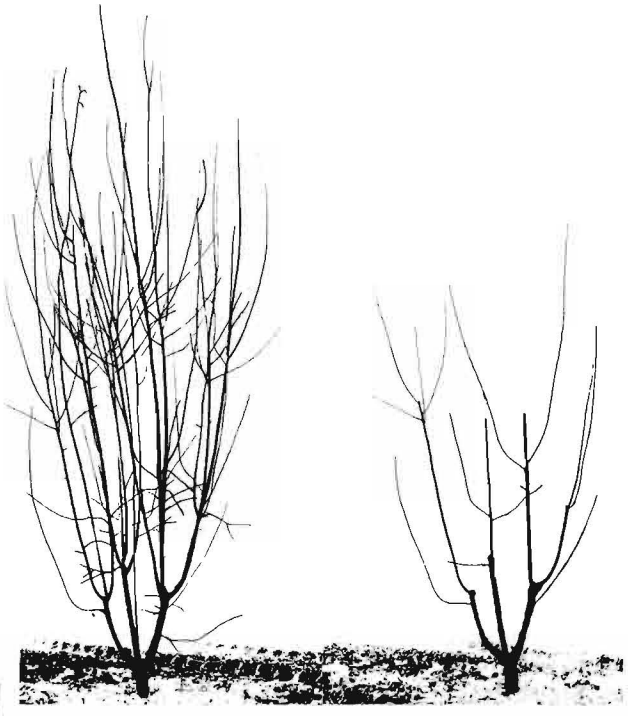

Fig. 8.7. Upright growing plum tree pruned to outside secondary scaffold limbs the second dormant season.

Each tree grows differently, and few develop completely symmetrical; thus, train each tree into the best possible framework from its available limbs. The open-center system is intended to provide adequate structural limbs for the tree's expanding fruiting area. Spreading trees, such as peach and nectarine, must be trained to maintain upright growth; very upright-growing trees (many plum varieties) must be trained to outward growth (fig. 8.8).

This training sequence is continued in the third and fourth dormant seasons as trees are pruned to

Fig. 8.8. Very upright growing plum trees are often spread by pruning to unheaded outward growing shoots. The weight of leaves and fruit causes shoots to spread the following growing season.

Fig. 8.9. Four-year-old peach and nectarine trees are pruned for both structural strength and production.

Fig. 8.10. Pruning to outward growing limbs to obtain both spread and fruiting spurs the third and fourth years on plum trees.

grow upward and outward (figs. 8.9 and 8.10). Open spaces are filled with scaffold limbs and fruiting branches. This dormant pruning pattern continues until trees reach their mature height.

After 4 years of growth and pruning, a tree should have three to four primary scaffolds at its crotch with five to seven secondaries 3½ to 4½ feet aboveground. Additional branches should fill the periphery of the treetop 7 to 9 feet aboveground. The center of the tree should be open to permit light infiltration that will maintain and stimulate further development of fruiting wood. Some small twigs must be left inside for shade on the main scaffold branches to reduce bark sunburn on the inside of scaffolds growing toward the north and east.

Pruning Mature Trees

Dormant pruning

Pruning methods for mature trees vary because of differences in fruiting habits, desired cropping levels, and acceptable tree size. To prune a tree selectively for crop load, one must know the age and type of wood that is fruitful on a particular variety. European and Japanese plums bear much of their fruit laterally on spurs (fig. 8.2). New spur wood grows less than 4 inches per year. Flower buds are produced laterally on spurs, and these give rise to fruit the following season. Peaches and nectarines, on the other hand, are fruitful on 1-year-old shoots (fig. 8.1).

Fig. 8.11. New fruitwood must be positioned uniformly around the tree annually on bearing peaches and nectarines.

Peach and nectarine. Because peach and nectarine trees bear fruit only on 1-year-old wood, new fruitwood must annually be positioned around the periphery of the tree (fig. 8.11). Varieties produced for fresh shipment respond well to careful pruning. Detailed pruning of processing varieties is less critical but still a vital cultural practice. Pruning not only adjusts a tree's potential crop size, but it also stimulates new shoot growth for the following year.

Fruitwood throughout the tree must be thinned during each annual dormant pruning. Fruit of late-maturing varieties have more time to grow and size before ripening, so more fruitwood is allowed to remain than for early maturing ones. To determine how much fruitwood to keep on a freestone peach or nectarine tree, a grower must first decide how much fruit the tree can mature to proper size (see chapter 10, **Fruit Thinning**). For example, to end up with 800 fruit on a tree, 400 fruiting shoots must be kept, assuming there are two fruits per fruiting shoot. With careful counting and evaluation, a grower can estimate what is needed and avoid excessive hand thinning of fruits the following spring. Annual dormant pruning is a grower's first opportunity to thin each new crop. To determine how much to prune, include the orchard's location, variety, soil, and ability to size fruit.

Japanese and European plums. Japanese and European plum trees bear much of their fruit on lateral spurs that are 2 years old or older. These spurs are usually 2 to 4 inches long on Japanese varieties and shorter on European ones. Many Japanese plum varieties set additional fruit on longer, 1-year-old shoots.

Japanese and European plum fruiting spurs live for 5 to 8 years, but many produce fruit of good size and quality for only half that time. Although it is necessary to prune for renewal of some spurs each season, most new growth is removed. Depending on the variety, 20 to 40 percent of the fruitwood around the tree is renewed annually by leaving young shoots and removing old wood. This eliminates excessive fruit bearing and reduces fruit thinning costs.

Japanese plum varieties vary widely in crop set. Some set very heavy crops and require extensive pruning of spur wood each year to reduce cropping. Horizontal lateral branches are often headed back after extensive spur growth has developed. Varieties that set lighter crops don't require as much fruitwood removal, but thorough pruning throughout the tree is still necessary. Replacement spur fruitwood (the amount depends upon the variety) is obtained by keeping unheaded 12- to 18-inch-long shoots that develop spurs during their second and third years of growth (fig. 8.12). Later, these shoots can be cut back as previously described. In general, spurs positioned next to or on large limbs produce the largest fruit.

European plum varieties have fairly long-lived spurs and usually require less fruit thinning than do Japanese varieties. Therefore, not as many large pruning cuts are required for European varieties. Pruning entails only moderate thinning of lateral fruiting wood

Fig. 8.12. Spur replacement on mature plum trees is accomplished by keeping unheaded shoots throughout the tree.

and results in trees with a bushier appearance than Japanese plums. European plum varieties tend to bear in alternate years, and growers often adjust their pruning according to the expected crop; for example, a light pruning follows a heavy crop.

Occasionally, large limbs must be removed from mature fruit trees. When such cuts must be made, the limbs should be removed completely with cuts close to their point of origin to aid healing. When cuts are made about ½ inch from the originating limb or trunk, the wounds heal faster. To avoid splitting the bark below the limb to be removed, first undercut it to about one-third of the way through and then finish the saw cut from above.

Summer pruning

In California's peach, plum, and nectarine orchards, vigorous growth often results in excessive shade. Once trees reach a desired height (commonly 10 to 14 feet), they are topped or cut back to the same point each year by hand shears or machine (fig. 8.13). Some growers mechanically top their trees in late summer or fall, but this does not replace selective hand pruning. Follow-up detailed pruning must be done in winter to eliminate development of proliferation of vigorous shoots arising from shoot stubs resulting from mechanical topping. Tree height is controlled by mechanical topping, and the removal of excess vegetation at the tops of trees allows sunlight to filter through, maintaining the integrity of lower fruitwood. During summer, some growers also prune to remove excessive vegetative growth and vigorous water sprouts to provide more sunlight to developing fruit and lower fruiting wood.

Fig. 8.13. Summer pruning (topping) by machine often helps to prevent shading of lower fruiting wood.

Additional Reading

Jackson, D. 1986. Temperate and Subtropical Fruit Production. Butterworth's Horticultural Books, New Zealand.

LaRue, J. H. and M. Gerdts. 1983. Growing Shipping Peaches and Nectarines in California. University of California Leaflet 2851.

_____. 1976. Commercial Plum Growing in California. University of California Leaflet 2458.

Micke, W., A. Hewitt, J. K. Clark, and M. Gerdts. 1980. Pruning Fruit and Nut Trees. University of California Leaflet 21171.

Westwood, M. N. 1978. Temperate Zone Pomology. W. H. Freeman and Company, San Francisco.